Senses of Insects.—M. A. Forel[1] contributes a most interesting and exhaustive account of experiments made by himself and many others on the much-discussed problem of the senses of insects.

(1) In regard to the *sight* of ants, he notes especially these three conclusions: (*a*) They perceive light, and particularly ultra-violet (Lubbock); (*b*) they really see the ultra-violet rays, without eyes they are almost indifferent to them, and only respond to solar light more or less intense; (*c*) the dermatoptric sensations are feebler among the ants than in the animals which Graber studied.

(2) After reviewing new and old experiments as to the sense of *smell* in insects, he notes the following general facts: (*a*) In many insects which are essentially directed by sight, as in the Libellulids and Cicadas, the antennæ are rudimentary, and the sense of smell likewise. During the night these insects are passive, while during the day they trust to their power of sight, or possibly, in some cigalids, also to hearing; (*b*) the sensitive region, in spite of Graber's protestations, is situated in the antennæ, especially in those parts where the antennary nerve ramifies; (*c*) in certain insects, as in most Diptera, the antennæ serve almost solely for smelling purposes; (*d*) in other cases, however, where they are mobile, as in the Hymenoptera, they are used for detecting their food or their mates at great distances.

(3) As distinct organs of *taste*, M. Forel regards the nervous terminations (*a*) on the proboscis of flies (Leydig), (*b*) on the jaws and on the base of the tongue (Meinert), (*c*) on the end of the tongue (Forel), and (*d*) on the palate or on the epipharynx (Wolff).

(4 and 5) Forel's results as to *hearing* are, as yet, too negative to admit of notice. He finally discusses the sense of *touch* in its various manifestations, and the last chapter of his interesting memoir discusses the relation of the five senses to the general psychical life of insects.—*Jour. Roy. Micr. Soc.*, 1887, p. 577.

ZOOLOGY.

Fresh-Water Sponges.—The *Proceedings* of the Philadelphia Academy of Natural Sciences for this year contain Mr. Edward Potts's monograph of "Fresh-Water Sponges." This paper contains, besides directions for collection and study, a translation of Vejdowsky's recent diagnosis of European Spongillids, a synopsis of all known North American species, and a *résumé* of all the known species of the world. The fifty-eight species are grouped in the genera Spongilla, Meyenia, Heteromyenia, Tubella, Parmula, Carterius, Uruguaya, Potamolepis, and Lubomirskia. The North American fauna embraces *Spongilla aspinosa*, *S. lacustris*, *S. fragilis*, *S. igloviformis* (nov.), *S. mackaya*, *S. novæ terræ*, *Mey-*

[1] Rec. Zool. Suisse, iv., 1887, pp. 161–240.

enia leidyi, *M. fluviatilis*, *M. robusta* (nov.), *M. milsii* (nov.), *M. subdivisa* (nov.), *M. baileyi*, *M. crateriformis*, *M. everettii*, *M. plumosa* var. *palmeri*, *Heteromyenia repens*, *H. argyrosperma*, *H. longistylis*, *H. ryderi*, *Tubella pennsylvanica*, *Carterius tubisperma*, *C. latitenta*, and *C. tenosperma*. Mr. Potts also describes as new *Parmula nesbyi* and *Meyenia minuta*, from South America. The paper is illustrated by eight well-executed process-plates of spicules, etc., of the species.

Arthropod Eyes.—The first number of Dr. Whitman's *Journal of Morphology* contains three articles dealing with the structure and growth of the eyes of arthropods. The first, by Dr. J. S. Kingsley, treats of the development of the compound eye of Crangon, an abstract of which appeared in the NATURALIST for November of last year. Dr. Kingsley claims that the compound eye arises as an invaginated pit of ectoderm, and that the retinal layers are inverted, the light traversing them in the same way as in the vertebrate retina.

The two other papers are by Dr. William Patten. The first, entitled "Eyes of Molluscs and Arthropods," is a summary of the results obtained by this author, and embodied in his longer paper in the *Mittheilungen* of the Naples Zoological Station for last year. The most important points brought out are that the whole of the so-called retinal elements of the compound eye are formed from a single layer of cells, and that this layer has not been inverted, as believed by Dr. Kingsley. He also shows that the rhabdoms of Grenacher are in reality formed by prolongations of the same cells which secrete the crystalline cones. According to his interpretations it follows that these eyes are not adapted for "mosaic vision," but that the nerve-fibres in the crystalline cones are the essential light and image percipient elements.

Dr. Patten's second paper deals with the development of the eyes of Vespa, and with some points in the structure of ocelli in insects. In the young embryos of Vespa the cephalic lobes present a thickening, which becomes pushed in and covered by an ectodermal outgrowth from the dorsal margin of the thickening. This thickening breaks up into at least six cords of cells, three of which ultimately enter into the formation of the optic ganglion, a fourth (dorsal to these) probably forms the antennal lobe, and the other two probably give rise to the mushroom bodies of the brain. While the foregoing steps are in progress a second thickening arises below the first, and sends inwards a process which forms the optic nerve. Then a shallow pit appears in the outer surface, and this becomes enclosed by a growth of ectoderm over it, so that this portion, which eventually forms the eye, in reality consists of three layers, the inner furnishing the retinal elements, which are erect, and not inverted as mentioned above in Crangon. Dr. Patten traces the development of the optic lobe from

the three cords of cells already mentioned, as well as the formation of the nerve-fibres and the inner and outer medulla. Besides this, he gives, but with less detail, the history of the retinal—or, to use the term with his significance, ommatidial—elements. In their history he agrees well with Dr. Kingsley.

Dr. Patten's paper contains a number of other observations. He shows that the median ocellus of Vespa arises as two ocelli, which later become fused together, while some points in the development of the compound eye (not mentioned here), as well as in the simple eyes of beetles, seem to prove that the compound eyes have arisen, not by a coalescence, but by a division of ocelli. Contrary to the views of Grenacher, Patten regards the ocelli of the larvæ of the water-beetles as practically closed vescicles, and composed primarily of three layers of cells, instead of open cups. In the posterior dorsal ocelli of the same beetle-larva Dr. Patten finds further a remarkable structure, in that on the dorsal side of these eyes exist two cell-layers, the outer of which seems to be continuous with the corneal hypodermis, while the other, the cells of which are elongate and rod-like, appears to be continuous with the retinal layer of the adjacent ocellus. These points, taken in connection with the facts that this extra-ocellar structure early becomes pigmented, and also receives a distinct nerve-supply, leads Dr. Patten to the view that this is but a dorsal extension of the true ocellus, and as pointing the way to the mode of division of the simple into the compound eye. The paper closes with some observations on the eyes of Phalangium.

Mr. F. E. Beddard, in the *Annals and Magazine of Natural History* for September, 1887, has a "Note on a New Type of Compound Eye," which he finds in Serolis and several species of Cymothoidæ, and which he regards as supporting Grenacher's rather than Patten's interpretations of some of the structures of the arthropod visual organs. The crystalline cone is secreted by two vitrella cells, and these have nothing to do with the secretion of the rhabdom of Grenacher (the pedicel of Patten). Below these vitrella cells come four elongate retinula cells, and between these are two large spherical transparent cells, and these six alone are concerned in the formation of the rhabdom, the outer four embracing it only at their outer extremities. This specialization of the retinula cells is regarded as a new feature, and one which recalls Patten's molluscan eyes, and especially his interpretation of Carriere's eye of Nereis. The author incidentally makes some corrections of his former account of the eye of Serolis, in the Report of the "Challenger" Expedition.

It may be stated, in conclusion, that American students promise to increase the literature of the arthropod eye to a considerable extent, as work is now being conducted upon the eyes of Limulus, Scorpions, Alpheus, Gammarus, and Trilobites, and possibly other forms.

Argiope riparia *var.* **multiconcha.**—For the past two years I have been studying an *Argiope*, which has sufficiently marked characteristics to entitle it to the rank of a variety of *A. riparia*, if not to a distinct species. The female is larger than any specimen I have seen of *A. riparia*, and she makes a group of cocoons, usually four, sometimes five, which she hangs in a cluster by the side of her snare, in the midst of an abundance of bright yellow, flossy silk. The cocoons are fashioned like those of *A. riparia*, and are about the same size. In honor of these multiple cocoons I call the spider *Argiope riparia* var. *multiconcha.*

Female 23 mm. long, first legs 33 mm. in length. The cephalothorax is about 9 mm. long, and nearly as wide as it is long, and covered with white hairs close up to the eyes. The two first legs are black, and the rest have the femora a deep orange-color. The abdomen is oval, and on the front is a sharp-pointed hump at each corner. The back of the abdomen is black interspersed with deep orange, darker than that of *A. riparia*, and the color is more irregular in outline than in riparia.

The under side of the body is colored and marked like *A. riparia*, and the epigynum is covered in the same way by a long black process.

The young look very different from the adult spider. Before the last moult there are five transverse bands of white and brown on the back of the abdomen. All of the legs are annulated with white and gray.

This spider lives in Guthrie, Missouri, and probably in other places. It frequents more sheltered places than our *A. riparia.* It likes to make its home under the roof of a piazza, and sometimes gets into houses, where, if undisturbed, it will hang its cocoons. I have a set of four cocoons that were made in a kitchen where a great cooking-stove was in almost constant use to supply the demands of a large family.—*Mary Treat.*

The Migration of the American Magpie to Eastern Nebraska, Twenty-five Years ago.—In Goss's "Birds of Kansas," 1886, p. 35, the magpie (*P. hudsonica*) is mentioned as "an occasional fall and winter visitant in Western Kansas," no mention being made of the magpie in Eastern Kansas. Dr. Aughey, in his list of "Birds of Nebraska," 1880, says "the magpie exists in Western and Northern Nebraska." Dr. L. E. Hicks, State University, in a private letter, dated November 4, 1887, says, "I have not seen the magpie in Eastern Nebraska, and only one in the western part: in Dawes County, last month. I have reliable information of a pair nesting near Grand Island. They undoubtedly breed in Nebraska."

Hence it is safe to conclude that the magpie (1887) is rather a rare bird in Eastern Nebraska, and most especially in the southeastern portion of the State. Such was not the case twenty or

thirty years ago. In questioning the early settlers about the birds of Southeastern Nebraska, between 1850–65, the magpie is usually the first bird mentioned. I am told by a dozen or more reliable persons that it was a greater pest than the common crow: pecking holes in the backs of fat hogs, eating off the tips of their ears, etc. They were very numerous in the fall and winter; one reliable witness stating that, about twenty years ago, he put out poison for the wolves, and on going to the spot the next morning found no less than forty dead magpies. The "Birds of North America in Smithsonian Institution," published in 1860, gives descriptions of twenty magpies killed in 1856, at various points on the Missouri from central Eastern Nebraska to the Black Hills.

I am fully satisfied that twenty or thirty years ago the magpie (*P. hudsonica*) made its annual fall and winter visit to the Missouri River bottoms, extending from Southeast Dakota to the Kansas State line, some few breeding in this section.—*W. Edgar Taylor, State Normal, Peru, Neb.*

Missouri River Crow-Roosts.—In vol. xx. p. 780, AMERICAN NATURALIST, it is stated that "the number of crows in the Western States, comparatively speaking, are so insignificant that their roosting-places have not been noticed by the ordinary observer." Probably the writer did not aim to include the Missouri Valley, yet such a conclusion seems to be general, but, undoubtedly, is incorrect.

A large roost of *C. americanus*, covering perhaps four or five acres, exists on Hogthief Island, in the Missouri River, about six miles above Peru, Neb., and fifteen miles below Nebraska City. Two other good-sized roosts are known, one ten miles north, and the other on an island eight miles south of Hogthief Island. Mr. N. S. Goss, author of "Kansas Birds," in a letter written October 29, 1887, says, "The crows had, several years ago, quite a large roost in a heavily-timbered bend on the Neosho River, in Allen County (Kansas), and I am informed that there is a roost on the Wakarusa River, in Douglas County, and without doubt there are several others in the State."

I am informed of several smaller roosts in Eastern Kansas and Southeastern Nebraska, but perhaps the greater number roost on Hogthief Island and contiguous territory. All the principal roosts, numbering, perhaps, not less than one hundred thousand crows, are in an almost direct north and south line not over one hundred and fifty miles in length. I am of the opinion that more than half of the above number roost on Hogthief Island and adjacent territory. The crows have been roosting on and near this island for at least twenty-five years, beyond which time, owing to the new settlement of the country, I have not, so far, been able to trace their history. Probably, at some time previous

to the settlement of the country, the crows at these various roosting-places in Eastern Kansas and Southeastern Nebraska had one roost,—different roosts being formed by the change of food-supply occasioned by the settlement of the country.

The crows assemble on the island named about the first of October and disperse about the first of May. About daybreak on a fine morning, when setting out for the day's journey, their chatter and noise, made in taking flight, may be distinctly heard in Peru, six miles away. A reliable witness, who has lived in the country for some ten or fifteen years, states that he has often "observed, flying in one direction, flocks of crows six miles long and one-half mile wide." In the winter the crows are so very plentiful in the surrounding country, including a radius of from twenty to forty miles, as to attract the attention of the most careless observer. Farmers have very often been compelled to guard their feed-pens. I have frequently been told by reliable persons that the crows in severe winters peck holes in the backs of hogs, in some cases eating off the ears.

Sometimes these crows roost in small bushes and large weeds, but generally in trees, often the willow or cotton-wood.

I am aware that many of these crows breed in this territory; this fact having been proven by Messrs. C. J. Pierson and J. M. Root, of the Normal Science Society, and by Mr. Goss and Professor Cragin, of Kansas. But it seems probable that some, at least, go to other territories for breeding; as several students living in Furnas, Hall, and other counties in Central Nebraska have noticed that in the summer and winter crows are very seldom seen, while large flying flocks are commonly observed in the spring and fall. However, we hope to investigate this point further, as well as determine something more definite as to numbers, former roosts, and mode of life.

The roost on the island may be plainly seen from the tower on the Normal School building.—*W. Edgar Taylor, State Normal, Peru, Neb.*

A Mink gnaws Iron Wire.—We have been troubled by minks in the trout-ponds and among the wild fowl in the water set apart for them. Six steel traps yielded four minks in three nights; two of these were caught by the fore leg and uninjured. A box was fitted with a partition, and the top of it covered with galvanized iron netting, one-inch mesh, such as is sold for poultry-yards. The first night they kept quiet, but the following one the large male gnawed a hole in the wire big enough to get his head through, and the wires cut his throat, so that he was dead in the morning. The female cut the wire sufficiently to get through, and was found loose in the room next morning. At present writing she is alive in the National Museum, where she was sent at the request of Prof. G. Brown Goode. I have kept

live minks with heavier wire-cloth, of smaller mesh, but never imagined that they could cut poultry netting.—*Fred. Mather, Cold Spring Harbor, N. Y.*

Fauna of Beaufort, N. C.—Beaufort has long been a favorite locality for zoological collectors, and the recent establishment there of the marine laboratory of the Johns Hopkins University has brought it into greater prominence. A recent number of the *Studies* of the university contains four papers on the fauna of the locality. Dr. McMurrich catalogues nine species of sea-anemones, *Sagartia pustulata* and *S. gracillima* being new. The molluscs of the region are enumerated by Dr. H. L. Osborn. His list is confessedly incomplete, but sixty-one species being enumerated outside of the group of Opisthobranchs, where the forms were not identified. Professor Nachtrieb, in his account of the ten species of echinoderms, gives considerable information of value, in that he mentions the probable or ascertained times of spawning of each species. Prof. O. P. Jenkins enumerates one hundred and thirty-four species in his list of fishes, of which twenty-three are not included in any previous catalogue of the fish-fauna of the locality.

The Pug-Dog and the Chihuahua Dog.—Two crania of pug-dogs which I have recently examined display identical dental characters, and show that the species cannot be referred to the genus Canis, but to the nearly allied form Synagodus Cope.[1] This genus differs from Canis in the presence of but two inferior true molars (one sectorial and one tubercular), and in the absence of the internal cusp from the inferior sectorial. The species may be called *Synagodus retusus*. It differs from *S. mansuetus* Cope, the type of the genus, in its excessively abbreviated muzzle and in the possession of two roots to the inferior tubercular tooth instead of one.

The Chihuahua, or naked Mexican dog, is the *Canis gibbus* of Hernandez,[2] and Pellone of the Mexicans. I have examined the dentitions of three specimens of this dog, and Professor Dugés has described and figured that of a fourth. In none of them is the second inferior molar present, and the internal cusp of the inferior sectorial is wanting in all. In other points the dentition is somewhat variable. The premolars are $\frac{2}{3}$ or $\frac{3}{3}$, and the true molars $\frac{0}{2}$, $\frac{1}{2}$, and $\frac{2}{2}$. In the specimen with three superior premolars the first two are rudimental. As the premolars are $\frac{4}{4}$ in Synagodus, the characters of the *C. gibbus* place it in the genus Dysodus Cope, where the premolars vary from $\frac{3}{3}$ to

[1] Proceedings Academy, Philadelphia, 1879, p. 186.

[2] See Dr. A. Dugés, Naturaleza, Mexico, 1880 (1882), p. 14, for an article on this dog.

$\frac{2}{2}$,[1] and where the second superior true molar is wanting. But one specimen of the *C. gibbus* possessed the second superior true molar. The species may be called *Dysodus gibbus*. It differs from the Japanese spaniel (*D. pravus* Cope) in its elongate muzzle, and in the great sparseness or absence of hair, in its erect ears, and in various other respects.

The characters of these genera are as well marked as those of non-domesticated forms of Canidæ. The deficiencies of dentition, although concomitants of reduced size, are not caused by it, since a majority of the extinct Canidæ, which preserve with great constancy the characters wanting in Synagodus and Dysodus, are of equal and smaller size.

I have had a female Japanese spaniel in my possession for eight years, and she has had pups several times. With one exception they never lived to be more than a few months old, and were of very erratic mental constitution. They displayed a great deal of ferocity in their family relations, nearly killing each other on several occasions. They nearly all died of convulsions.—*E. D. Cope.*

EMBRYOLOGY.[2]

The Rudimentary Pineal Eye of Chelonians.—In the *Quar. Jour. of Micr. Sci.* for October, 1886, W. Baldwin Spencer describes very fully the presence and structure of the pineal eye in Lacertilia, but makes no mention of its occurrence in any of the Chelonia. The other day, while looking over some sections prepared by the writer from an embryo of *Chrysemys picta*, presented by Dr. C. S. Dolley, Prof. J. A. Ryder called my attention to an organ which he took to be the pineal eye. Subsequent investigation showed this to be the case.

The embryo first cut was one measuring three-quarters of an inch from the tip of its nose to the end of the tail. The sections were made in a vertical longitudinal direction, and in the median line the structure referred to was found. The pineal outgrowth lies just behind the fore-brain; the proximal part of its stalk is tubular, while the distal end is flattened from above. It curves towards the tip of the snout, and its lower surface faces the inner margins of the cerebral hemispheres.

The eye occurs as a hollow vertical evagination from the upper surface of the pineal outgrowth, and leaves the stalk of the latter at the beginning of its distal fourth, measuring from its rear end. The two together, the eye and the pineal body, resemble very much in longisection the outline, as seen from the side, of the hammer of a gun.

[1] Naturalist, 1881, p. 233, where the dental characters of eight specimens are described.

[2] Edited by JOHN A. RYDER, Ph.D., Biological Department, University of Pennsylvania, Philadelphia.